









Vocal and Respiratory Conditioning Program (CVR II): new proposal for voice professionals

Programa Condicionamento Vocal e Respiratório (CVR II): nova proposta para profissionais da voz

Programa de Acondicionamiento Vocal y Respiratorio (CVR II): nueva propuesta para profesionales de la voz

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Abstract

This is a continuation (VRC II) of a recent proposal to present a Vocal and Respiratory Conditioning (VRC I) Program using new vocal and respiratory muscle training strategies aimed at contributing to a better performance of voice professionals. Once again, the initiative included the integrated participation of speech-language pathologists and physiotherapists, as well as voice professionals as participants. Ten meetings were planned in the initial proposal, with the first and last meeting focused on data collection, the proposal aimed to further increase the vocal and respiratory resistance of the participants, promoting better professional performance. Semi-occluded vocal tract and respiratory exercises were performed with using the New Shaker® and Respirom Athletic 2® boosters. This is an experience reported in order to encourage other professionals to put into practice actions for vocal and respiratory conditioning. The

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Authors' contributions:

LPF, MCMB, PPBZ, RE: study conception and outline; methodology; data collection; critical review and guidance.
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use of respiratory boosters and the partnership with Physiotherapy are recommended, aiming at a better understanding and consequent care of voice and breathing issues in voice professionals.

Keywords: Voice; Speech Therapy; Voice Training; Breathing Exercises; Endurance; Respiratory Function Tests.

Resumo

Proposta recente de apresentação de Programa de Condicionamento Vocal e Respiratório (CVR I) incentivou a continuidade (CVR II), considerando novas estratégias de treinamento muscular vocal e respiratório que pudessem contribuir para melhor desempenho de profissionais da voz. Para a condução da ação, mais uma vez, houve a participação integrada de fonoaudiólogos e fisioterapeutas e, no papel de participantes, profissionais da voz. Planejada para dez encontros, em que dois deles (início e fim) foram destinados à coleta de dados, a proposta teve como objetivo aumentar ainda mais a resistência vocal e respiratória dos participantes, promovendo melhor rendimento profissional. Exercícios de trato vocal semiocluído e respiratórios foram realizados com o uso dos incentivadores denominados New Shaker® e Respirom Athletic 2®. Trata-se de mais uma experiência relatada na direção de convocar outros profissionais a colocarem em prática ações para o condicionamento vocal e respiratório de profissionais da voz. O uso de incentivadores respiratórios e a parceria com a Fisioterapia são apresentados e recomendados para melhor entendimento e consequente atendimento das questões da voz e da respiração.

Palavras-chave: Voz; Fonoterapia; Treinamento da voz; Exercícios Respiratórios; Endurance; Testes de Função Respiratória.

Resumen

Una propuesta reciente de presentar un Programa de Acondicionamiento Vocal y Respiratorio (CVR I) fomentó la continuidad (CVR II), considerando nuevas estrategias para el entrenamiento de los músculos vocales y respiratorios que podrían contribuir a un mayor desempeño de los profesionales de la voz. Para conducir la acción, una vez más, se contó con la participación integrada de fonoaudiólogos y kinesiólogos, y en el papel de participantes, profesionales de la voz. Planificada para diez encuentros, en los que dos de ellos (inicio y final) están destinados a la recolección de datos, la propuesta tiene como objetivo aumentar aún más la resistencia vocal y respiratoria de los participantes, promoviendo un mejor desempeño profesional. Se realizaron ejercicios de tracto vocal y respiratorio semiocuidos con el uso de incentivos denominados New Shaker® y Respirom Athletic 2®. Esta es una experiencia más reportada en la dirección de invitar a otros profesionales a poner en práctica acciones para el acondicionamiento vocal y respiratorio de los profesionales de la voz. Se presenta y recomienda el uso de soportes respiratorios y la asociación con Kinesiología para una mejor comprensión y consecuente atención de problemas de voz y respiración.

Palabras clave: Voz; Logopedia; Entrenamiento de la Voz; Ejercicios Respiratorios; Resistencia Física; Pruebas de Función Respiratoria.





Introduction

Given that there are still only a few bibliographic sources describing proposals for vocal and respiratory conditioning, we recently published the description of an action carried out with voice professionals, attended at the Orofacial Motricity and Voice Service of the Clinic of the Department of Education and Rehabilitation of Communication Disorders of the Pontifícia Universidade Católica de São Paulo (Derdic/PUC-SP), called Vocal and Respiratory Conditioning and Respiratory Conditioning (VRC)¹.

This publication detailed the strategies carried out, focusing on semi-occluded vocal tract exercises using the LaxVox® silicone tube for vocal work, and respiratory muscle training using the Respirom Classic® respiratory booster. The findings showed that the Program presented and the therapeutic strategies planned for better vocal and respiratory conditioning can be a powerful proposal aiming at positive effects in voice professionals¹.

In order to deepen the knowledge on the subject of vocal and respiratory conditioning, we planned a new intervention proposal that could further increase the participants' vocal and respiratory resistance. There was a clear need to once again have professors and students from the Speech Therapy and Physiotherapy Courses at PUC-SP, given the power of this integration².

As previously reported, the vocal exercises of the first initiative used commercial straws and tubes for vocal conditioning. However, the device called New Shaker®, present in the practice of respiratory physiotherapy and recommended for hygiene and bronchial clearance³, has been shown to be effective in speech-language pathology intervention proposals. The use of the device to perform exercises with voiced blowing can provide increased resistance, better performance and readiness for moments that require high performance and voice overload. A study including normophonic individuals without vocal complaints and dysphonic individuals with vocal complaints investigated the effects produced by New Shaker® and found an improvement in the source-filter ratio and a decrease in the severity of vocal and laryngeal symptoms in both groups, with women improving more in terms of laryngeal symptoms, while men had improvements in terms of vocal symptoms⁴.

The voiced high-frequency oral oscillation performed with the aid of the New Shaker® device was also applied in a study with elderly women, which compared this technique with the technique of sounded blowing with a resonance tube⁵. Although this experience resulted in an improvement in vocal quality, both techniques showed similar results in the participants' self-perception of vocal and laryngeal symptoms

Another study also investigated the effect of voiced high-frequency oral oscillation on the voice and proprioception of dysphonic individuals, concluding that exercises performed with the New Shaker® device promote an intense vibration of the entire cartilaginous skeleton, helping to release tension in the larynx and reducing the phonatory effort. In addition, the authors reported that such exercises can generate a retroflex resonance, due to the presence of the metallic sphere inside the device. This retroflex resonance consists of the return of the energy produced by the glottis, promoting the dissipation and reduction of laryngopharyngeal tension and improvement of glottic coaptation⁶.

With regard to respiratory muscle conditioning, it should be noted that Physiotherapy and, more recently, Speech-Language Pathology, have been using the Respirom® respiratory booster, recommended for strengthening the respiratory muscles. The equipment has three levels of difficulty when performing the act of inhaling, according to the selected intensity, aiming to strengthen the respiratory muscles, increase inspiratory volumes and endurance during exercise, reducing the feeling of effort⁷.

A clinical study with healthy elderly people aged between 60 and 84 years investigated the influence of incentive spirometry on lung function. Subjects were randomly assigned to a group that used the Voldyne® device (volume booster) and a group that trained with Respirom®. The study aimed to evaluate the maximum inspiratory and expiratory pressure (MIP and MEP), forced vital capacity (FVC), expiratory volume in one second (FEV₁), tidal volume (V_t), minute ventilation (VE), respiratory rate (RR) and thoracoabdominal cirtometry, reassessing the individuals after daily training for a period of 12 consecutive days. The study found no significant difference between the groups, which indicates that both the flow (Respirom®) and volume (Voldyne®) boosters were



effective in improving lung function in individuals undergoing a healthy aging process⁸.

In this sense, while the previous study included the Respirom Classic®, at this moment, the Respirom Athletic 2® was selected aiming to increase the difficulty and consequently intensify the respiratory muscle conditioning. This device was associated with the use of the New Shaker®.

It should be noted once again that, as in the previous study, this proposal was developed as a group work, as it is a dynamic little explored by speech-language pathologists, although highlighted in the literature as being a potent strategy^{9,10}.

Due to the COVID-19 pandemic, this action had to be carried out synchronously remotely, using Microsoft Teams, which also led to discussions about this type of service. The area of speech-language pathology gave little prominence to remote care, but, due to the social isolation imposed by the pandemic, greater attention was given to this modality, which generated new studies showing the positive effects of telephonoaudiology in 2021^{11,12}. It is not just about a new way of presenting the same content, but about planning a set of practices and procedures updated as new processes and technologies emerge, thus imposing new challenges.

Thus, the goal at this moment is to describe the Vocal and Respiratory Conditioning Program, now called VRC II, a proposal for speech-language pathology and physical therapy intervention in a group, in the direction of deepening the understanding of the effects resulting from the use of new devices that contribute to improving conditioning vocal and respiratory health of voice professionals. Results of the application of this proposal can be found in reading the annals in which the proposal was presented^{13,14}.

Description

After completing the work carried out with voice professionals, called Vocal and Respiratory Conditioning (VRC I) in 2019, the possibility of continuing the project was discussed in order to observe the effects of new respiratory boosters used by physiotherapists, and more recently by speech-language pathologists, who proposed the use of these tools in an adapted way, aiming to verify benefits in the use of voice by professionals of spoken and singing voice.

The same principles previously established were maintained, namely: frequency, which would be the number of times that a given exercise would be performed per day or week; duration, that is, to set the duration of an exercise or the number of repetitions of a given series; intensity, which corresponds to the type of exercise in relation to the effort; and, finally, the progression of the exercises, monitoring the progress of each participant.

As previously explained, the proposal was carried out using Microsoft Teams, which represented another challenge for the team. This platform was selected due to its efficiency and easy accessibility for holding meetings, recording and consequent data collection. Furthermore, this is also the official platform used by PUC-SP and, consequently, by Derdic, where Dr. Maria Cristina Borrego and Patrícia Bertelli Zuleta, Msc, work, as they are responsible for the Orofacial Motricity and Voice Service, and who, therefore, also led the VRC II proposal. As an object analyzed in research of Scientific Initiation of students of the Speech-Language Pathology and Physiotherapy Courses, the professor advisers of each Course also monitored the whole process.

The inclusion criteria of the participants were as follows: being a voice professional, regardless of age; not having respiratory disease and vocal and cognitive disorders that would prevent understanding and carrying out the proposed exercises; having participated in the previously proposed VRC I Program and, finally, responding to the request to carry out the program being presented (VRC II) with the commitment to continue throughout the process.

Thus, the study included three participants, namely: S1-singer; S2-speaker/imitator; S3-sports announcer. All were male, non-smokers, taking no medication and with a mean age of 29.6 years.

In order to carry out the VRC II, participants were asked to purchase the New Shaker® and Respirom Athletic 2® respiratory boosters. Part of the material used in VRC I was present in the first meetings, such as the Respirom® Classic and LaxVox® devices.

At each CVR II meeting, before starting the work, the participants were asked about their weeks, the challenges they face, and the difficulties they noticed, at which time their doubts were also clarified. Despite the *a priori* determination of a sequence, the demand, needs and possibilities of each participant were always respected.





In addition, even though 10 meetings were planned in the initial proposal, the first and last of which were to collect data from the Scientific Initiation research of the students involved, the VRC II was carried out in eleven meetings, which can be explained by the absence of some participants during the process. The defined workload was one and a half hours for each meeting, totaling around 17 hours.

Respiratory muscle training started with two sets of ten repetitions, with alternating focus between the external intercostal muscle (apical breathing) and two sets of ten repetitions for the diaphragm muscle (diaphragmatic breathing). There was an increase in the level of difficulty from the 6th week on, in which two sets of 12 repetitions were performed for the external intercostal muscles and two sets of 12 repetitions focusing on the diaphragm muscle, using the Respirom Athletic 2® device. It should be noted that proprioception was stimulated so that these muscle groups were correctly activated in each series.

Initially, the vocal exercises included the use of the LaxVox® silicone tube and, later, they used the New Shaker® device. In the first meetings, the participants were asked to produce a sounded breath alternating between modulated, monotone and high-pitched sounds using the LaxVox® device, with 10 repetitions with an average duration of 15 seconds. Then, from the 5th meeting onwards, the New Shaker® device was introduced and the participants received the same instruction to produce a sounded blow, but with a decrease in the average time for carrying out the exercise, varying with each subject, since the introduction of new equipment was being proposed, which required more strength from the participants. In the meetings, the participants were asked to do 10 repetitions of each production and, in the last three meetings, 12 repetitions, in addition to performing the exercises in high monotone and then with modulation of tones from low to high and vice versa. Chart 1 shows the sequence of meetings.

Chart 1. Summary of the activities carried out with the participants each week.

Weekly meeting	Breathing Work			Vocal Work (total of 2-3 minutes)			
	Instrument	Series	Repetitions	Instrument	Seconds	Sound	Repetitions
1 ^o	Respirom Athletic II ®	2 Apical	10	LaxVox®	14	Monotom	10
		2 Diaphragmatic muscles	10			Modulated	10
2 ^o	Respirom Athletic II ®	2 Apical	10	LaxVox®	16	Monotom	10
		2 Diaphragmatic muscles	10			Modulated	10
3 ^o	Respirom Athletic II ®	2 Apical	10	LaxVox®	16	Hyperacute	10
		2 Diaphragmatic muscles	10			Modulated	10
4 ^o	Respirom Athletic II ®	2 Apical	10	LaxVox®	16	Hyperacute	10
		2 Diaphragmatic muscles	10			Hyperacute	5
5 ^o	Respirom Athletic II ®	2 Apical	10	New Shaker®	5	Hyperacute	10
		2 Diaphragmatic muscles	10			Hyperacute	10
6 ^o	Respirom Athletic II ®	2 Apical	12	New Shaker®	6	Hyperacute	10
		2 Diaphragmatic muscles	12			Hyperacute	10
7 ^o	Respirom Athletic II ®	2 Apical	12	New Shaker®	7	Hyperacute	12
		2 Diaphragmatic muscles	12			Habitual	10
8 ^o	Respirom Athletic II ®	2 Diaphragmatic muscles	12	New Shaker®	8	Modulated	12
		2 Apical	12			Hyperacute	12
9 ^o	Respirom Athletic II ®	2 Apical	12	New Shaker®	10	Hyperacute	12
		2 Diaphragmatic muscles	12			Modulated	12
10 ^o	Respirom Athletic II ®	2Apical	12	New Shaker®	10	Monotom	12
		2 Diaphragmatic muscles	12			Hyperacute	12
11 ^o	Respirom Athletic II ®	2Apical	12	New Shaker®	10	Monotom	12
		2 Diaphragmatic muscles	12			Hyperacute	12



The exercises presented each week should also be performed at home daily, once a day, so that the participants should perform the task according to the number of series and repetitions worked during the meetings.

Every day, participants should mark on a specific record sheet the feeling of respiratory and vocal comfort before and after performing the exercise on two visual analogue scales (VAS), that is, two horizontal lines of 100 mm, respectively. These records were given to the researchers at the last meeting. Unlike the record made when the previous VRC I¹ program was developed, in which the participants brought the information recorded at home each week, this program was different and some weeks had no notes. In some cases, participants reported that they had completed the exercises but had not recorded them, and in other instances, participants had not had time to complete the requested task.

The same previously proposed self-assessment instruments¹ were applied before and after the proposed practice, namely: Vocal Fatigue Index (VFI); Voice Handicap Index 10 (VHI-10); and Evaluation of the Ability to Sing Easily - EASE-BR; all in a translated and adapted version for Brazilian Portuguese^{15,16,17}.

Data collection for vocal and respiratory assessments was carried out in person at Derdic, at the beginning and end of the program, as mentioned above, in compliance with all the biosafety parameters recommended by the Ministry of Health and in force during the pandemic. The voice assessment followed the script used in Derdic, which includes the collection of recorded speech samples of the vowel /a/ produced three times, in addition to a spontaneous speech in the form of a statement by the participants about how they felt in times of pandemic. Based on these data, the researchers evaluated the following parameters: maximum phonation time (MPT), pitch, loudness, resonance, pneumophonoarticulatory coordination, speech rate, articulation and modulation. Then, the speech sample of the participants was submitted to auditory-perceptual analysis by three speech-language pathologists, specialists in the area of voice, who initially considered the assessment *per se* and then concluded the analysis by consensus.

In addition, the following respiratory measurements were recorded: measurements of respiratory muscle strength through maximum respiratory

pressures, MIP (maximum inspiratory pressure) and MEP (maximum expiratory pressure), using an analog manovacuometer; respiratory muscle endurance (RME), using a spirometer and axillary and thoracic circumference using a measuring tape, in order to obtain quantitative data on the respiratory muscle strength of individuals.

Some open questions were asked to participants in the previous experience (VRC I¹) to assess the form and content of the program, (“Was it good? If so/no, why?” “Would it be better if...”). At this time, the researchers decided to apply a form prepared on the Google Forms® platform and sent remotely, which included questions about the use of participants, and the methodology in a group and synchronously remotely.

After the completion of VRC II, ten questions were aligned to help guide future initiatives

1. Self-assessment protocols are important tools for assessing the impact of a voice problem on quality of life¹⁸, providing valuable support to clinicians. On the other hand, this instrument also allows the participant to get in touch with aspects related to the perception and use of the voice. Therefore, the self-assessment instruments can be understood as a strategy to raise awareness of issues that will be worked on throughout the training program. The continuous discussion of these issues in carrying out the exercises each week can also help to adapt the content of the meetings and to share solutions in order to solve the difficulties of the participants.
2. The three subjects did not record voice handicap in the VHI-10 even before the intervention started, with an even lower record for two of the participants at the end of the VRC II. As for the VFI, two of the participants had a decrease in fatigue and vocal restriction, while one patient showed vocal discomfort. As for the EASE-BR, the scores of the subscales varied among the participants. It should be noted that, at the time of VRC II, participants were not carrying out their professional activities in the same way as they had been doing before the pandemic. Mandatory social isolation changed the day-to-day life of these professionals and added other concerns.
3. In turn, the analysis of the physiotherapeutic assessment found a significant improvement in respiratory indices and a decrease in the





- perception of respiratory effort in the post-training of the three participants. In line with the initial hypothesis, there was an increase in all respiratory parameters, since the Respirom Athletic® device aims to work by stimulating the muscles involved in breathing, contributing to greater resistance and less fatigue.
4. The respiratory issue also had more changes in the previous experience, VRC I¹ which leads to the conclusion that both the Respirom Classic® breathing booster for beginners in the Program, and the Respirom Athletic 2® for those who continued vocal and respiratory conditioning, can be used and contribute to positive effects in their use. Therefore, it can be concluded that, if respiratory muscle performance is essential for vocal production, the use of these boosters, in a gradual follow-up with the subjects, can bring benefits in terms of not only respiratory conditioning, but for better dynamism in respiratory muscle activation for vocal work¹⁹;
 5. Based on the participants' opinion, the New Shaker® provided greater vocal projection, better possibility of producing higher pitched sounds and more vocal flexibility, with positive effects on the self-perception of vocal and laryngeal aspects, which is in line with the reports of other authors^{6,20}. Some of these aspects were also registered in some parameters of the vocal evaluation of one or another participant, which can be caused by the participation of subjects without vocal alteration. Therefore, it seems relevant to note that the improvement was observed with greater occurrence in the self-reported data by the participants than in the auditory-perceptual evaluation of the voice. In addition, there is a relevant aspect to be evaluated regarding the best positioning of the New Shaker® with the objective of producing sounds, mainly the high notes. The adjustment of the device must guarantee the best positioning of the mouthpiece for total sealing, the stability of the metallic sphere aligned with the horizontal plane, and also the sonorous breath must be produced without effort and prolonged. Therefore, this detail should be explored by voice professionals. This device has been used for a long time by physiotherapists in the prevention and rehabilitation of bronchopulmonary infections and to reduce air trapping in people with obstructive pathologies, but it has also proved to be potent in helping voice production.
 6. As for the speech-language pathology assessment, there was an increase in the maximum phonation time in all participants, with an average record of 10.5%. Vocal quality and other parameters analyzed varied between records of increases, decreases or stability at different times, showing that the difference in vocal production, as previously mentioned, may be more frequent in self-assessment reports than in auditory-perceptual assessment.
 7. When evaluating the form and content of the Program, it can be noted that the three participants refer to improvements directly related to the purpose of the proposal, as well as the strategies and devices used. According to reports, the use of the Respirom Athletic 2® provided less effort when speaking, less vocal fatigue and faster voice recovery after intensive use, in addition to registering increased respiratory measures and maximum phonation time. It should also be noted that the increase in air storage capacity has a positive impact on respiratory quality and dynamics, in addition to the balance of laryngeal efficiency^{21,22}. From the moment they were introduced to the equipment, the participants of the VRC II had frequent complaints about the difficulty in using the boosters, as they require more strength and body awareness in the execution of the movement. However, these complaints decreased over the weeks. Due to the visual feedback given, the use of Respirom®, for example, which is seen as a cheap and simple-to-use device, encourages individuals to perform the activity in the best possible way, thus promoting greater adherence of the participants²³.
 8. The practice of recording the exercises during the week is recommended and proves to be important so that the participant can incorporate this practice into their daily lives, providing information about their performance, that is, as a self-assessment, in addition to allowing the therapist to be able to monitor the difficulties or progress in its implementation. In the previous experiment, the record was made using notes, but this time, the participants recorded it using visual analogue scale (VAS) markings. When comparing the two modalities, the decision for the best format was hampered by



the conditions, as the VRC I¹ was carried out in the face-to-face modality, in which the participants had to present the record every week, while the VRC II was remote, and the records did not always were delivered, and were also accompanied by a report of all the difficulties arising from social isolation due to the pandemic. Despite understanding the importance of this record, there is still no consensus on the best tool to be used to ensure participant engagement. In the analysis of the record referring to the weekly exercises at home, there was less adherence by the participants, which differs from the data collected in a previous experience¹. Probably because it was carried out during the pandemic, the intervention had a smaller participation, mainly in the last weeks of the Program. In this sense, studies carried out during this period recorded that uncertainties about the future led to mental suffering and, therefore, it is necessary to be attentive to possible illnesses²⁴. In addition to the presence of a physiotherapist, a potential solution to this problem would be the inclusion of a psychologist in the team, aiming at an interdisciplinary approach to the management of psychosocial issues. This is in line with the idea that the human voice/communication is an efficient means of expressing feelings, opinions, wills and ideas, reflecting the physical and emotional state of the subjects²⁵.

9. Carrying out the VRC II in a group reinforces the importance of this format and facilitates the development of strategies during an action aimed at improving aspects related to voice and communication. Some authors emphasize this issue and point out that this dynamic is more present in prevention actions, and is still little explored by speech-language pathologists as a therapeutic strategy^{9,10,26}, despite being a resource used in physical therapy.^{9,10,27}
10. As previously mentioned, although the VRC II was required to be carried out remotely, at first this did not cause difficulties on the part of the participants to understand the guidelines and carry out the exercises. When comparing the two possible modalities (face-to-face and remote), most participants reported a preference for the face-to-face mode, but, at the same time, they contemplated the possibility of a mixed proposal in future Program groups. In

times of a pandemic, carrying out the VRC II remotely allowed participants to have access to speech-language pathology and physical therapy training and also contributed to improving their quality of life, since the meetings allowed them to share problems arising from this moment experienced by all. At the beginning of each meeting, there was a moment for the participants to introduce themselves and talk about their weeks, and there were frequent testimonies referring to important changes in routines and great emotional instability, reduction of work activities, and consequent impact on income, as well as the need to innovate and reinvent the use of voice in the period, due to the Covid-19 pandemic. So, despite the preference for face-to-face care, the remote format of the VRC II did not compromise its execution, and became an example of an efficient application and resource in telephonoaudiology. It should be noted that the literature also reports the need for participants and group professionals to have knowledge about the use of technology, in addition to having physical and cognitive abilities to do so¹¹, and, in this sense, the group underwent adaptation, satisfaction and acceptability of this care modality.

Final Considerations

This is an experience reported in order to encourage other professionals to put into practice actions for vocal and respiratory conditioning. The use of respiratory boosters as a proposal to improve vocal and respiratory conditioning and the partnership with Physiotherapy are presented and recommended, aiming at a better understanding and consequent care of voice and breathing issues in voice professionals.

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